REMARKS

Claims 1-2, 5, 7-23, 51, 53, 55-66, and 68-75 are now pending in the application. Claims 3-4, 6, 24-50, 52, 54, and 67 are cancelled and Claims 13 and 14 remain withdrawn for being drawn to a non-elected species. Dependent Claim 75 is new; Claims 1, 7-9, 51, 55-56, 64-65, and 68-69 are presently amended. Support for the amendments to independent Claims 1, 51, and 64 is found by way of non-limiting example at Paragraphs [0033]-[0034], [0040], [0043], and Figures 2-3 and 8-10 of Applicants' specification as originally filed. Support for additional limitations found in independent Claim 51 can be found at Paragraph [0046], for example. Support for the amendments to dependent Claims 7-8, 55-56, 64-56, and 68-69 can be found in Applicants' originally filed specification at Paragraphs [0031], [0033], [0043], [0045], and Figures 2-3, and 8, by way of non-limiting example. No new matter has been added. In view of these claim amendments and the remarks contained herein, the Examiner's reconsideration of the rejections and allowance of the claims is respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 103

Claims 1, 2, 5-12, 15-21, 23, and 51-74 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Miyazawa (U.S. Pat. Pub. No. 2003/0235735, hereinafter "*Miyazawa*") in view of Yamada (U.S. Pat. No. 5,432,023, hereinafter "*Yamada*"). As noted above, Claims 6, 52, 54, and 67 have been cancelled, thus the rejection is moot with respect to these claims. For the remaining claims, this rejection is respectfully traversed.

Claim 22 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over *Miyazawa* and *Yamada*, as applied to Claim 1 above, further in view of *Davis* (U.S. Pat. Pub. No. 2002/0001743, hereinafter "*Davis*"). This rejection is respectfully traversed.

Independent Claims 1, 51, and 64 have been amended to commonly recite that the flow channels comprise lands and grooves and that the liquid distribution media (LDM) contacts the fluid distribution layer (FDL) in regions corresponding to the lands to form an electrically conductive path between the impermeable electrically conductive element and the conductive FDL. Independent Claim 51 further recites that the liquid distribution medium (LDM) comprises a first layer and a second layer arranged so that the first layer contacts an impermeable electrically conductive element and the second layer contacts the FDL in regions corresponding to the lands to form an electrically conductive path between the impermeable electrically conductive element and the conductive fluid distribution layer (FDL). Claim 51 additionally recites that the porous FDL has an average pore size larger than an average pore size of the second layer of the LDM and the first layer of the LDM is less hydrophilic than the second layer.

KSR v. Teleflex has not affected the fundamental requirement that each and every claim limitation must be found in the combination of the prior art references before the obviousness analysis proceeds. *Abbott Labs. v. Sandoz, Inc.*, 89 USPQ.2d 1161, 1171 (Fed. Cir. 2008). As acknowledged by the Examiner at Pages 9-10 of the Office Action for example, the cited art fails to teach an impermeable separator plate having lands covered by an LDM that contacts an FDL and forms an electrically conductive path there through. The cited art, *Miyazawa* and *Yamada* have previously been addressed extensively and aside from salient aspects, will not be repeated herein.

The *Miyazawa* reference teaches away from the invention recited in amended independent Claims 1, 51, and 64, because it prohibits the "hydrophilic membrane 14" from contacting electrodes so that any residual water during shut down is fully drawn into grooves so as to not detrimentally affect initial power generation efficiency at low temperatures. Paragraph [0033]. Thus, *Miyazawa* describes applying the hydrophilic membrane coating 14, but then in all embodiments removes it from the lands 23 of the ribs 11 by blasting in "Step S5" to achieve its stated objective. See Paragraphs [0033], [0040] and [0048]. Hence, as reflected in the modified version of Figure 2 from *Miyazawa*, the separator has "a hydrophilic membrane 14 is formed on the bottom 13 and on both wall faces 12 of the gas flow groove 7 formed between the ribs 11." Paragraph [0028], see also [0035].

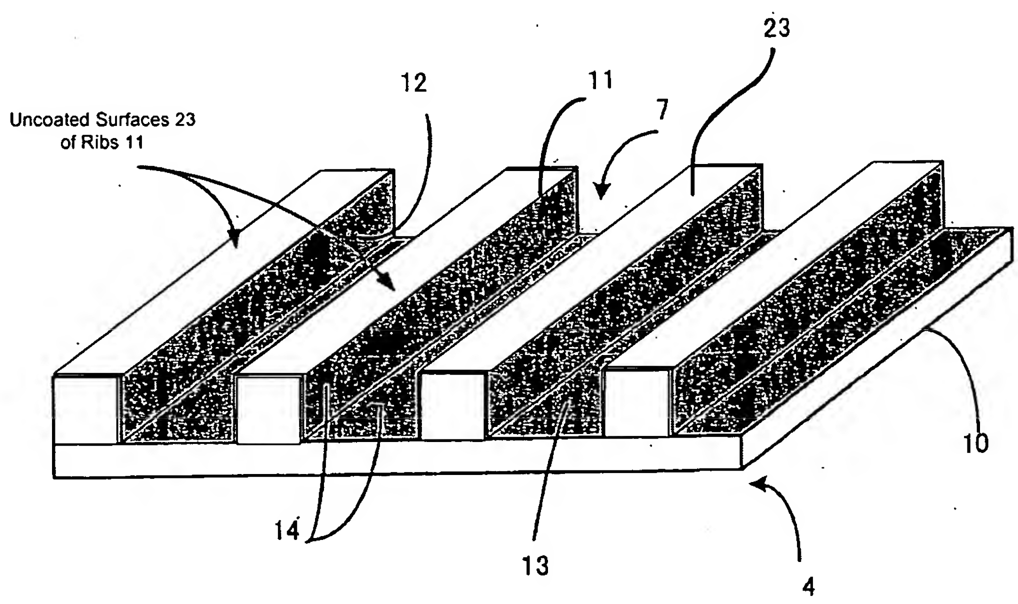

FIG. 2

Miyazawa attributes its success in increasing initial power generation efficiency

by drawing water away from the lands via the hydrophilic membrane only being placed on the sidewalls and groove to avoid water freezing near the electrodes. Nothing in the art would suggest to a skilled artisan any apparent reason to modify *Miyazawa* in the feature that is attributed to achieving its success. *Eisai Co. Ltd. V. Dr. Reddy's Labs., Ltd.,* 533 F.3d 1353 (Fed. Cir. 2008).

Yamada does not describe or suggest an electrochemical cell having an impermeable electrically conductive element having lands covered by an LDM that contacts an FDL and forms an electrically conductive path there through. Nor does *Yamada* suggest any such architecture to a skilled artisan. The fuel cell of *Yamada* is a simplified architecture for miniaturization where a gas diffusion layer (GDL) is entirely absent. Yamada describes in detail forming a membrane-electrode-assembly (MEA) having a fuel electrode (anode), a "nipped electrolyte plate," and an oxidant electrode (cathode). Much of the discussion of porosity referenced in *Yamada* pertains to designing the porosity of thee electrode itself or to forming a porous electrolyte plate from a polyelectrolyte ionomer on a physical support, for example. This discussion in *Yamada* has little pertinence to a skilled artisan to materials outside of the specialized function of the MEA, which requires constant reactant flow to active materials like catalysts and/or the electrolyte membrane at specific pressure conditions to generate electric potential via the fuel cell reactions. Nowhere does *Yamada* describe two distinct porous layers used inside an active area of a fuel cell aside from the MEA structure itself.

While *Yamada* describes external transport systems for wicking liquid fuel and water to and from the electrodes of the MEA in the so-called third embodiment, the

water-recovering wick is "made of inorganic or organic fibers" that are electrically non-conductive and are not suitable for use in the active regions of the fuel cell that experience harsh conditions, including acids, electrical potential, and the like not found external to the fuel cell. Indeed, as acknowledged by the Examiner, *Yamada* teaches away from selecting a water distribution medium to be electrically conductive, as "the materials for the wicks [to transport liquids] are not allowed to be conductors because conductors possibly form a cause for a short circuit." Col. 47: 10-15; s*ee also,* Col. 38: 8-9 and 67-68; and Col. 39: 21-25.

With regard to porous layers adjacent to the cathode having different pore sizes to draw water to an external reservoir at Col. 9:63 – Col. 10:17, again this discussion pertains to these wicking materials external of any active region of the active fuel cell. The selection of claimed pore sizes of the LDM and the FDL as claimed relates to the use of such materials in an active flow field for a fuel cell, where they encounter, liquids, gases, and vapors. Specifically, the selection of porous materials and pore sizes of the FDL and LDM in the active region of the fuel cell relates to optimizing the capillary pressure and mass flux, while taking into consideration the permeability properties of the porous material, as well as a range of differential pressures experienced during fuel cell operations across the flow field. See for example, Applicants' specification at Paragraphs [0036]-[0041].

The claimed invention provides efficient transfer of water over the entire electrode active face at operating pressures and provides better separation of liquids and gases via the respective porosities of the LDM and FDL, thereby reducing mass transfer resistance and increasing operational efficiency. Additionally, where the LDM

covers the lands of the electrically conductive element, the surface area of electrical contact is beneficially increased and enhances withdrawal of liquids from the FDL that may otherwise collect over the lands, as it would in *Miyazawa*, for example. See Applicants' Specification at Paragraph [0043]. Nothing in *Miyazawa* would suggest modifying it in a manner that would render it unsuitable for its intended purpose (to avoid the hydrophilic membrane from contacting the land regions of the rib to prevent water freezing near the electrode to cause power inefficiency during start-up). The combined teachings of *Miyazawa* and *Yamada* teach away from the claimed invention, which provides strong indicia of non-obviousness. In sum, amended Claims 1, 51, 64 and their dependent claims are not rendered *prima facie* obvious by the combination of *Miyazawa* and *Yamada*.

For these additional reasons, independent Claim 51, its dependent claims, and Claims 12 and 65 are non-obvious in view of the combination of *Miyazawa* and *Yamada*. First, the cited references lack any disclosure of two distinct layers in the active region serving as an electrically conductive LDM on the lands of the flow channels contacting the FDL. Additionally, the prior art fails to suggest a porous FDL having an average pore size larger than an average pore size of the second layer of the LDM, where the first layer of the LDM is less hydrophilic than the second layer. This configuration defies the teaching of *Yamada*, which states that the average pore diameter should decrease (to increase hydrophilicity) in the direction of flow of the water (Col. 10: 16-17; Col. 38: 10-11, 24-27). Yet in the claimed apparatus, the first layer contacting the impermeable electrically conductive element has a lower hydrophilicity than the second layer that is closest to the FDL, yet water flows down to the first layer

for enhanced transport and removal from the active region. In other words, this LDM configuration directly contradicts what is described in the art. As such, Applicants respectfully submit that the cited references do not support a *prima facie* case of obviousness for the claims as amended and reconsideration of the rejection is requested.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

Dated: July 30, 2009

By: /s/ Jennifer Woodside Wojtala/
Jennifer M. Woodside Wojtala
Reg. No. 50,721

HARNESS, DICKEY & PIERCE, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

AMB/JMW